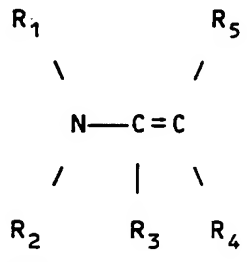
Claims

1. Vulcanization accelerators constituted by compounds, derived from secondary amines, belonging to the class of enamines.

2. Vulcanization accelerators constituted by compounds belonging to the class of enamines, having the general formula (I):



(I)

wherein:

-- R_1 and R_2, which are the same, or can be different from each other, represent an either linear or branched-chain C_1-C_{18} alkyl radical; a C_2-C_{18} alkenyl radical; a C_3-C_8 cycloalkyl radical; a C_6-C_{18} aryl radical; a C_7-C_{20} alkylaryl or arylalkyl radical; or R_1 and R_2, taken jointly and together with the nitrogen atom, represent a C_3-C_8 heterocyclic radical, possibly containing a second heteroatom selected from O, S and N;

-- R_3 and R_4, which are the same, or can be different from each other, represent a hydrogen atom; an either linear or branched-chain C_1-C_{18} alkyl radical; a C_2-C_{18} alkenyl radical; a C_6-C_{18} aryl radical; a C_7-C_{20} alkylaryl or arylalkyl radical; or R_3 and R_4, taken jointly and together with the C=C double bond to which they are bonded, represent a C_3-C_{12} cycloalkenyl radical;

-- R_5 represents a hydrogen atom; an either linear or branched-chain C_1-C_{18} alkyl radical; a C_2-C_{18} alkenyl radical; or in the case when R_3 represents a hydrogen atom, an either linear or branched C_1-C_{18} alkyl radical, a C_2-C_{18} alkenyl radical, a C_6-C_{18} aryl radical or a C_7-C_{20} alkylaryl or arylalkyl radical, R_4 and R_5, taken jointly and together with the carbon atom bearing the C=C double bond, represent a C_3-C_{12} cycloalkylenic radical.

3. Vulcanization accelerators according to claim 2, in which R_1 and R_2 are methyl, ethyl, propyl, pentyl, hexyl, heptyl, ethylhexyl, butyl, octyl, phenyl.

4. Vulcanization accelerators according to claim 2, in which the C_3-C_8 heterocyclic radicals, in the case when R_1 and R_2 are taken jointly and together with the nitrogen atom, are morpholine, pyrrolidine, piperidine, piperazine, thiomorpholine, thiazolidine, benzothiazolidine.

5. Vulcanization accelerators according to claim 2, in which R_3 and R_4 radicals are methyl, ethyl, propyl, butyl, phenyl.

6. Vulcanization accelerators according to claim 2, in which the C_3-C_{12} cycloalkenylic radicals, in the case when R_3 and R_4 are taken jointly and together with the C=C double bond to which they are bonded, are cyclopentene, cyclohexene, cycloheptene, cyclooctene, cyclododecene.

7. Vulcanization accelerators according to claim 2, in which R_5 radicals are methyl, ethyl, propyl,

butyl, hexyl, heptyl.

8. Vulcanization accelerators according to claim 2, in which the C_3-C_{12} cycloalkylenic radicals, in the case when R_4 and R_5 are taken jointly and together with the carbon atom bearing the C=C double bond, are cyclohexylidene, cyclooctylidene.

9. Process for synthetizing the vulcanization accelerators according to any of the preceding claims, which comprises the reaction of 1 mol of a secondary amine having the general formula (II):

(II) HNR_1R_2

in which R_1 and R_2 have the same meaning as disclosed above, with 0.5 mol of an aliphatic or an alicyclic aldehyde or of an open or cyclic ketone, having at least 1 hydrogen atom in alpha-position to the aldehydic or ketonic carbonyl group, in the presence of a catalyst, at temperatures comprised within the range of from 20°C to 120°C, under the atmospheric pressure and during a time of from 0.5 to 8 hours.

10. Process according to claim 9, in which the secondary amines having the general formula (II) are morpholine, piperidine, pyrrolidine, dimethylamine, dipropylamine, diethylamine, dibutylamine, diisopropylamine, dibenzylamine, dicyclohexylamine, N-alkyl-aryl amines, piperazine, diallylamine, thiazolidine, thiomorpholine.

11. Process according to claim 9, in which the aliphatic or alicyclic aldehydes are butyraldehyde, n-hexaldehyde, n-heptaldehyde, n-octaldehyde, cyclohexanecarboxyaldehyde, cyclooctylaldehyde.

12. Process according to claim 9, in which the open or cyclic ketones are cyclopentanone, cyclohexanone, methyl-ethyl-ketone, methyl-butyl-ketone, butyrophenone.

13. Use of the vulcanization accelerators according to any of claims from 1 to 8, in either natural or synthetic rubber.

14. Use of the vulcanization accelerators according to claim 13, in which the synthetic rubber are selected from SBR, NBR, BR, EPDM.

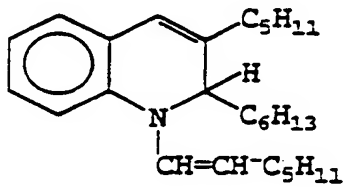
15. Use of the vulcanization accelerators according to claim 13 or 14, either as the only vulcanization accelerators, or in combination with other vulcanization accelerators.

16. Use of the vulcanization accelerators according to claim 15, in combination with mercapto-benzothiazole sulfenamides.

17. Manufactured articles obtained from the vulcanization of natural or synthetic rubbers in the presence of vulcanization accelerators according to any of claims 1-8.

18. As novel compound, the enamine having the formula (III):

(III)



useful as a vulcanization accelerator.

19. Compound according to claim 18, useful as a

vulcanization accelerator in natural or synthetic rubbers.

20. Compound according to claim 19, in which the synthetic rubbers are selected from SBR, NBR, BR, EPDM.